Module 2 - To Err is Human

ME3023 - Measurements in Mechanical Systems

Mechanical Engineering

Tennessee Technological University

Topic 1 - Accuracy and Error

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- Thought Experiment
- Accuracy and Error
- Estimating Error
- Uncertainty Interval

Thought Experiment

Thought Experiment: Look around the room and choose an object. It can be anything. Ask yourself the following questions.

- What is the **true** length of the object?
- How can you find the **true** value? Can you measure it?
- ...

Image: T.Hill

Accuracy and Error

The exact value of a variable is called the _____ value. The value of the variables as indicated by a measurement system is called the _____ value. The _____ of a measurement refers to the closeness of agreement between the _____ value and the _____ value. But the _____ value is rarely known *exactly*, and various influences, called _____ , have an effect on both of these values. So the concept of the _____ of a measurement is a *qualitative* one.

$$error = measured\ value - true\ value$$

Text: Theory and Design of Mech. Meas.

Estimating Error

The **true value** can be estimated but cannot be known *exactly*. In practice a reference value is used in place of the true value. We will discuss this again the the *Calibration Module*.

$$accuracy = \frac{|error|}{reference\ value} \times 100$$

An estimate of error based using this value is sometimes referred to as _____ accuracy.

Uncertainty Interval

"The _____ is a numerical estimate of the possible range of the error in a measurement. In any measurement, the _____ is not known exactly since the true value is rarely known exactly. But based on available information, the operator might feel confident that the error is within certain bounds, a plus or minus range of the indicated reading. This is the assigned _____ ."

We will discuss this again the the *Uncertainty Module*.

Text: Theory and Design of Mech. Meas.